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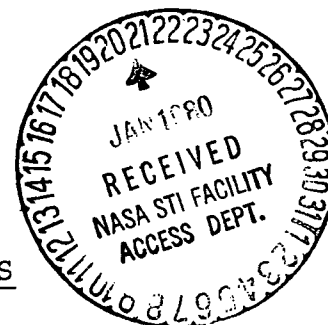
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## SPACE SUPERBUBBLE 1,200 LIGHT YEARS ACROSS



A superhot, superbubble of gas, apparently confined to a gigantic, glowing ring or shell some 6,000 light years away from Earth and some 1,200 light years in diameter, has been discovered, centered in the prominent summer constellation Cygnus, the Northern Cross.

The discovery was made from satellite data by Dr. Webster Cash, Laboratory for Atmospheric and Space Physics at the University of Colorado, Boulder, and his co-investigator, Dr. Philip Charles, Space Science Laboratory, University of California, Berkeley. They used X-ray data from NASA's Earth-orbiting High Energy Astronomy Observatory-1.

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(NASA-News-Release-80-3) SPACE SUPERBUBBLE  
1200 LIGHT YEARS ACROSS (National  
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Dr. Cash reported the sphere contains enough superheated gas at 2 million degrees Celsius (3.5 million degrees Fahrenheit), to create 10,000 new stars like our Sun. Its energy output is equal to 10 times the amount of the entire energy emitted by our Sun since its formation some five billion years ago. There are very few astrophysical processes in the galaxy which are capable of supplying this much energy. The most powerful explosion known to astronomers is that of a supernova, an exploding star, but a supernova releases only about 3 percent of the energy needed to make the superbubble.

What puzzles scientists is finding an answer to how this huge amount of energy got locked up in this gigantic halo in the first place. Dr. Cash thinks there may have been a series of explosions of supernovas in the region over the past three million years, perhaps anywhere from 30 to 100 which, in sequence, together created the superheated superbubble.

Here's how it may have happened according to Dr. Cash: A huge cool gas cloud, measuring 800 by 3,000 light years, known as the Great Rift of Cygnus can be seen obscuring the Milky Way in Cygnus on a dark night.

This dark cloud has enough material to make five million stars and lies right next to the observed superbubble. In fact, it obscures the central part of the bubble as seen from Earth.

About three million years ago a supernova exploded and impacted the gas cloud with part of the star blowing into interstellar space. As the force of the explosion moved through the cloud, the compression caused the gas to coalesce about 100,000 years later, forming a group of perhaps 1,000 stars of which number about 10 would become supernovas. Supernova stars have a lifetime of only about one million years.

These 10 stars would explode, in turn, pushing the gas cloud back farther and causing more stars to form along its edge as the compression on the cloud continued. At the same time, the force of the explosions away from the cloud caused a sweeping effect on interstellar space making a shell or bubble of superheated hydrogen material that became the immense superheated, superbubble we see in X-ray data today.

Dr. Cash said these chains of star formation are a major mechanism for making new stars. "The Sun may well have been formed at the edge of a similar bubble," he said.

The reason the huge halo was never spotted before is because, Dr. Cash says, "it flows so energetically that it cools through emission of X-rays instead of more normal emissions that can be seen in the optical or infrared regions of the spectrum." The hotter a substance is the shorter its radiation wave length.

Although parts of it had been seen before in brief X-ray glimpses, no one knew what was being observed. One part, for example, was thought to be a supernova remnant, while another part was believed to be hot gas escaping from the galaxy.

Because of its large size, the bubble or halo, was not seen in its entirety until it could be picked up in the X-ray sweep provided first by the High Energy Astronomy Observatory launched in August 1977. The spacecraft burned up as it reentered the Earth's atmosphere last March after accomplishing its mission.

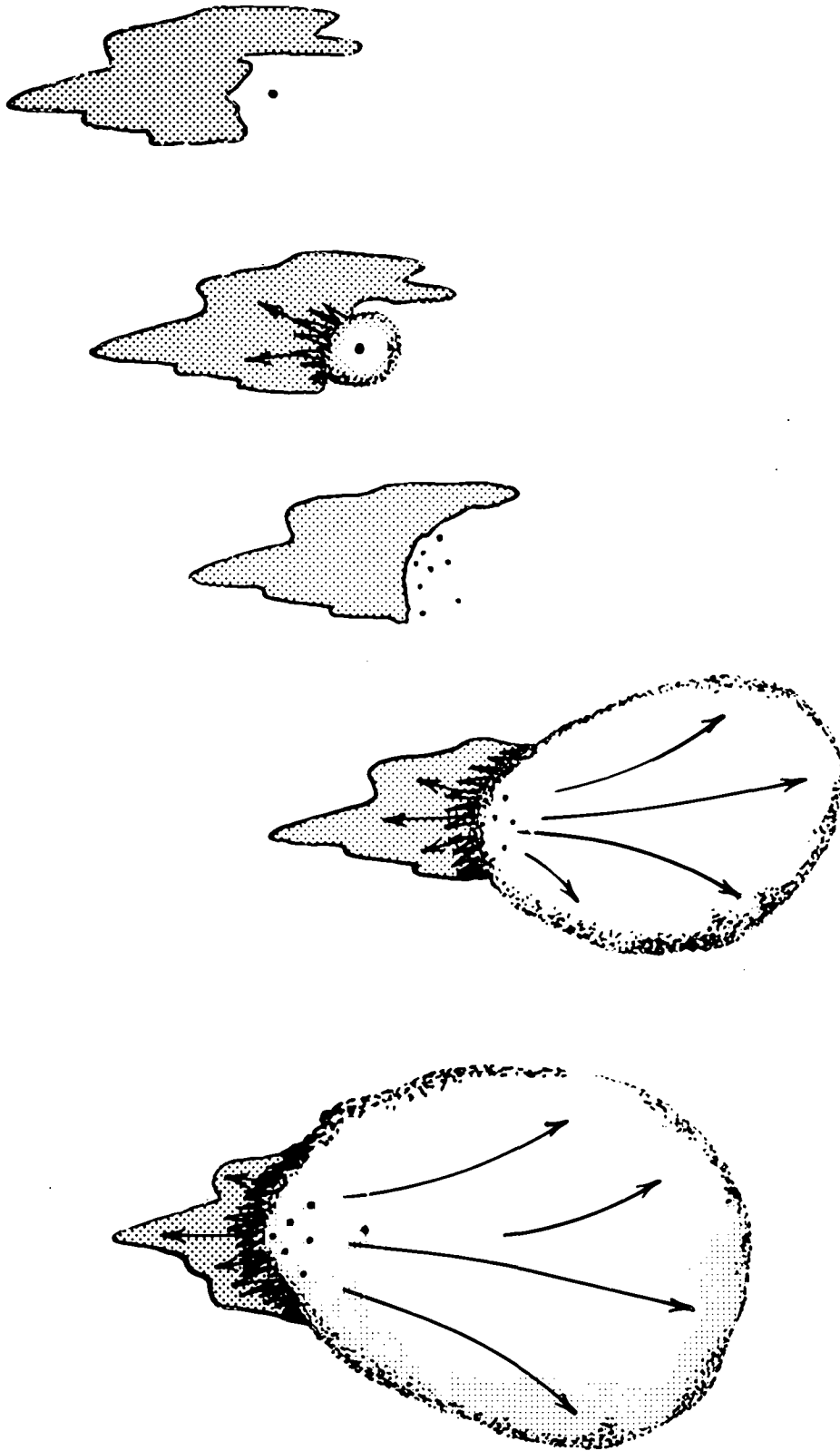
The observatory was built by TRW Systems, Redondo Beach, Calif. The High Energy Observatory Project management is under the direction of NASA's Marshall Space Flight Center, Huntsville, Ala.

The cosmic X-ray experiment instrument from which the data were made available to the two scientists was built under the direction of Dr. Elihu Boldt, NASA Goddard Space Flight Center, Greenbelt, Md., and Dr. Gordon Garmire, California Institute of Technology, Pasadena.

(Dr. Cash was scheduled to give his paper on this subject late Wednesday, Jan. 16, in San Francisco at a meeting of the American Astronomical Society.)

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Schematic shows (top to bottom) five steps in the evolution of a superbubble: Cloud and star; star becomes supernova and shock wave strikes cloud; new stars are formed from cloud; new stars become supernovas and create the bubble, which starts to inflate; and finally, as more stars are formed, the superbubble grows even larger.

# THE X-RAY HALO OF THE NORTHERN CROSS

